

# The relationship between urban street configuration and office rent patterns in Berlin

CONCLUSIONS

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## About this thesis

This thesis presents a study of the influence of urban street configuration on the pattern of commercial office rents in Berlin. The hypothesis is that there is a relationship between the two, and that the alteration of the street network with reunification has precipitated a spatial reorganisation of office rents.

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## **9 CONCLUSIONS**

### **9.1 Introduction**

The aim of this thesis as it was stated at the very beginning of the first chapter, is to contribute to that area of social science that looks at the unintended social consequences of spatial layout: the effect of space onto society. The study of Berlin presented here has provided a series of findings that offer a dramatic example of the effect that a spatial change can have on the organisation of the property market. In this chapter, a summary of findings will be presented to show how this study has formed a contribution to knowledge in this field. The main conclusions from the thesis will be summarised. Some limitations of the study will be evaluated and some suggestions for further research in light of findings will be provided. Lastly, a discussion of the meaning of the findings within a broader theoretical context will be provided.

### **9.2 Summary of Findings and Conclusions**

The hypothesis of the thesis as stated in the introduction was that there is a relationship between the spatial configuration of the street grid and the pattern of office rental values. In order to test this hypothesis, an independent measure of location has been applied to Berlin and a sample of achieved rents has been gathered.

The review of previous research identified three kinds of problem in the study of the spatial pattern of office rents. Firstly, rent data has often been used that may not be a good reflection of the price that a tenant is prepared to pay (most frequently used is the asking price at a high level of aggregation). Secondly, rent studies have been hindered by the lack of an independent measure of location against which to test the pattern of rents. The variety of spatial variables that have been used have not been truly independent and have therefore confused the whole analysis of the role of location in rent determination. Lastly, the spatial representation of office rent patterns has been neglected despite the fact that the few examples of rent maps have been highly informative.

Chapter 3 presented the methodological strategy that has been adopted in this thesis to overcome the problems revealed by previous studies of the spatial pattern of rents. By gathering actual lease data a sample of rent was used that more closely reflects the value that real tenants are prepared to pay. Space syntax analysis of urban morphology was adopted to provide independent measures of location against which the pattern of rents can be compared.

GIS was used as a method to visualise direct representations of rent patterns at the highest level of detail.

In chapters 4 and 5 the findings of the space syntax analysis of Berlin's spatial structure were presented. The spatial analysis of Berlin's historical development revealed that the pattern of commercial land uses changed over time following changes to the spatial structure of the street grid. The location of the CBD itself was found to be dependent on the layout of the street network. This finding effectively invalidates the use of distance from the CBD as a proxy for rents except in the very short term because it is not static over time. The spatial analysis of reunification showed how this event led to a fundamental spatial restructuring of the city. The pattern of global integration shifted from two centres in the two halves of the city to a new centre in Mitte. Published evidence showed that Mitte has risen as one of the two peaks in office rent and has also been the focus of new building in the post-reunification boom. However, the pattern of rents displayed in agents reports showed two peaks in rent value: the West Berlin CBD and Mitte.

The detailed analysis of the non-spatial characteristics of leases revealed that during the recession in the period under study, all the lease terms changed reflecting a shift from a landlord to a tenants market. The analysis of lease incentives revealed a hidden trend in the market that was not shown in the published agents reports: incentives rose just before the major wave of supply was completed and were given first in older buildings. Potential measures of effective rent were explored on a small sub-sample of leases to test the comparability of the main sample and were found to correlate well with headline rents.

This study has found that it is possible to represent office rent values objectively using GIS visualisation techniques. Location rent values were taken from a location-blind MRA and represented in colour maps. These showed a shift in the pattern of location rent within the short period under analysis. Whereas the Western CBD was the peak area of location rents in 1991-1994, the pattern in 1995-97 had shifted to Mitte. This is direct evidence that prime location rents have reorganised around the new spatial structure of the city revealed by the measure of global integration.

Chapter 9 showed that it was possible to model the determination of rent values in Berlin statistically using MRA. This analysis found that the independent variables of time and space alone were important in rent determination. The statistical model revealed a difference between West and East Berlin, whereby rents in the West were most strongly influenced by time, falling with the recession and secondarily by the spatial variable of global integration of

divided Berlin. In the East, the strongest variable was not time but global integration, and it was the reunified pattern of integration that was significant. This is a statistical reflection of the decline of the old centre in the West and the rise of a new one that relates to the potential of Mitte within the new spatial structure of Berlin.

The findings summarised above lead to the conclusion that there is indeed a relationship between the spatial configuration of the street grid and the pattern of office rental values. The fact that changes in the spatial structure of the street network have been followed by changes in the pattern of rents leads to the conclusion that it is a functional relationship and that the pattern of rents is *emergent*. The emergent pattern of location rents relates to an *independent* location variable (the purely spatial characteristics of the street grid). The changes in the spatial structure of the street grid that occurred with reunification were the precursor to the shift in rental value that has occurred since the fall of the wall.

The findings suggest that the pattern of rents depends not on the current local conditions of a location but rather on the *potential* offered by the location relative to the whole city. The fact that the western CBD has declined in location rent and the new centre in the spatial core of reunified Berlin has risen so quickly could be seen as evidence that the agglomeration economies offered by local services are not as important as the relationship between an area and the whole city. Even though the east was an area in very poor condition at reunification without any companies in it, its potential from its position within reunified Berlin has outweighed the existing benefits of being near other companies that the West Berlin Centre could claim.

The reunification of Berlin provides a dramatic example of the influence that the spatial structure of the city can have on rent patterns in the short term. The results of the historical analysis of Berlin's morphological development also point to spatial configuration of the city exerting an influence on the organisation of land uses in the longer, historical term. The traditional approach to studying rent patterns purely within the context of the pattern of land uses (using variables such as distance to the CBD to represent the spatial dimension) would not capture these relationships that both land use and rental value have with the underlying spatial configuration of the city in the Berlin case. The analysis of spatial structure used in this thesis has allowed these relationships to be studied independently of each other, from which a better understanding of how they all relate to each other can be built. Rather than viewing rent patterns through the lens of the land use pattern (where distance to the CBD is the spatial variable), it has been possible to view the spatial structure, the pattern of rent and the pattern of land uses as three distinct, interacting structures.

### 9.3 Limitations of the Study

As well as summarising the findings about the relationship between the configuration of the street grid and the pattern of rent values, it is also valuable to make clear the limitations of this study.

#### 9.3.1 *Building Quality*

A limitation of the study is that although building quality has been implicated as an important variable both in rent determination and in broader landlord-tenant relationships, the dummy variable used does not capture the role of building differences adequately. It is clear that the buildings themselves need to play a much more sophisticated role in the explanatory model of rent determination.

The build quality dummy variable used in this study is limited in two respects. Firstly, the difference between new and old buildings may not adequately capture all the structural and fit out differences between buildings. The untested variables relating to this were discussed in section 6.5.4 on page 223. But there is also a level at which the building quality variable does not capture the micro-scale spatial differences between units, such as the flexibility of the floorplate. A much more detailed set of data is necessary in order to begin to tackle the complexity of building stock as part of the rent equation.

#### 9.3.2 *Insufficient differentiation in the axial map measures of location*

As well as the inability of the build quality variable to capture such micro-spatial differences as the shape of the floorplate, another limit of the study has been the spatial differences between the locations of leases that the axial map analysis has not accommodated. These are of two kinds. Firstly, the single spatial value for an entire street axis does not capture the differentiation in rent values that occurs along the length of an axis. The representations of rent in the literature review showed variation along streets as well as the more pronounced variation between them (see for example Hurd's map reproduced as Map 2.2 on page 62). This lack of spatial differentiation in the axial map prevented the spatial measures from capturing all the spatial differentiation in rent in the statistical analysis of the MRAs. This was shown in Figure 8.13 on page 265, in which a degree of variation left in the residual of the MRA was found to be systematically spatially organised with reference to the axial lines. This demonstrated that the axial map is not sufficiently differentiated to fully capture rent patterns.

The second limitation of the axial map is the inability of the spatial analysis to provide measures of location within a building complex. The location values used in this study have not taken into account the location of a unit within a building (such as the floor it is located on and whether or not it is in the front, side or back wing of the structure). The historical survey in Chapter 4 showed that the internal structure of the typical Berlin 'Mietskaserne' blocks was significant in the pattern of mixed uses that developed. This was because rental value was highly differentiated within the block, and that differentiation was organised by the spatial structure of the block, getting lower the further into the internal courtyards and away from the street (as discussed in section 4.5.1 on page 149 above). Such differences have not been captured with the axial map analysis. Although in principle it would be possible to use the axial map to model not just the external space of streets but also the entire internal configuration of all buildings, this is practically impossible for a spatial object as large and complex as the city of Berlin.

These limitations suggest ways in which further research might be directed, as discussed in the next section below. However, the limitations do not undermine the validity of the main findings of the study about the spatial pattern of rents and its relationship to the configuration of the street grid. The findings are statistically significant in spite of the limitations of available methods outlined above.

#### **9.4 Suggestions for Further Research**

A number of avenues for further research are suggested by the findings of this thesis:

##### *9.4.1 A measure of the whole system of public space*

The first suggestion for further research follows on directly from the limitations of the axial map analysis highlighted in the previous section. The axial map analysis of the spatial configuration of Berlin has been restricted to the street network in order to undertake a clear comparison of the spatial layout of the city with rent patterns. However, the effective spatial system used by people every day is much bigger than solely the street network. In order to test the theory that the spatial configuration of the city has an influence on space use phenomena such as rent and land use patterns more fully, it would be necessary to construct a measure of location that encompassed the whole physical complexity of the layout of the city. This would include not just streets but the spaces inside buildings and the subterranean movement system. If people use rooms, corridors and streets to move about in and interact with each other, then a true model of the urban grid ought to capture this spatial object at a

much greater level of detail. This could provide for a measure of location that was differentiated at a much greater level than the axial map used in this study.

#### *9.4.2 The relationship between street configuration and the supply of office space*

The findings of this study suggest that the pattern of land uses can also be viewed as an emergent property of the layout of streets. There is evidence from the study of a spatial feedback mechanism from rent price signals to supply increases: where price signals are higher- (in integrated locations) there is more chance of buildings being renovated or the use being changed to office. The higher average integration of the old office buildings compared to the new buildings found in chapter 9 could just be an artefact of the sample, but it could also represent a response of building owners to the potential of location: if a site will achieve a higher commercial rent then it is worth turning it over to office<sup>41</sup>. This would be the classically expected role of rent as the mechanism for selection of land use, encouraging change of use towards office in more globally integrated locations and away from office in more segregated locations.

In order to test this thesis it is necessary to obtain data on the supply structure as a whole, in order to obtain accurate measures of the distribution of commercial land uses within the pattern of all land uses. A sample of buildings that were not originally offices but were converted to office could be compared with the sample of all buildings that were intended to be offices but were converted to another use to see whether spatial differences could be detected. Then the comparison of their locations could test the hypothesis that the rent pattern arising from the spatial structure was acting as a land use allocation mechanism. In order to fully build a model of land use determination, the role of developers acting on these price signals within constraints would have to be accounted for. This would require other kinds of data to cover their constraints, for example relating to planning procedures and the process of development finance.

#### *9.4.3 The discrepancy between asking rents and headline rents as market information*

In chapter 3 it was explained that achieved rents were sought for this study of tenants location preferences because the use of asking rents as a proxy for achieved rents was problematic. This is because of the arguments of Webb and Fischer outlined in the literature review that asking rents are essentially supply side information (Webb and Fisher 1996).

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<sup>41</sup> The designation 'old-build' includes residential buildings that have been converted to office.

However, precisely because asking rents represent supply side information, it would be extremely useful to be able to test the difference between asking rents and headline rents. This test would be informative not only in order to assess the extent the use of asking rents as a proxy for achieved rents is problematic, but also to see whether there were relationships between the discrepancy of asking to achieved rents and any other variable. For example, does the difference between asking and achieved prices vary with the market cycle? Does it differ with regard to building quality? Most of all, it would be useful to know if there is a clear spatial pattern to the difference and whether it also had a relationship to the street layout that was found with rents. This would tell us something about the variables which lead to a discrepancy between what landlords think they can get and what tenants are prepared to pay.

#### *9.4.4 Vacancy as an index of location preference*

This study has used the level of rents that tenant's pay as an index of demand preferences for location within the city. However, demand preferences are also revealed at a more basic level by the choice of tenants to rent or not to rent at different locations. This is reflected in the level of vacant space. A study of vacancy rates in each building might even reveal more about tenant demand in cases of recession where rates are high, as they have been in Berlin (see discussion in section 5.8 on page 186).

Indications from studies of other cities are that vacancy rates are also strongly spatially organised and in a global pattern that is related to that of rents, but with the highest vacancies on the edge and lowest in the middle (as discussed on page 42 of the literature review above). Agents' reports have also suggested that vacancy rates in peripheral areas of Berlin were much higher (see page 186 of chapter 5 above). The pattern of vacancy rates could be tested using similar spatial measures to those used on rents in this study. However it must be recognised that obtaining accurate data on vacancy rates is very difficult. Accurate figures for the office space on the market and for space already let are required and these are very difficult to obtain.

#### *9.4.5 Lease provision instability and market transition*

One hypothesis arising from this research is that the market instability of lease provisions other than rent can be used as an indication of transition in the power relations of the market. In Berlin there has been market transition through both recession and spatial restructuring. Tenants took advantage of the upheaval in Berlin that came with the recession to question other aspects of the lease, such as the lease length. It seems that when transition takes place

everything about the status quo is disrupted and power relationships have to be re-established within the market.

Previous research has already shown that there is a relationship between some lease provisions, particularly incentives, and the broader market conditions (as discussed in section 2.5.1 on page 35 of the literature review above). The results from the Berlin study suggest that lease incentives may also be differentiated with respect to the quality of buildings in the market because incentives rose first in old buildings. This could be tested in other cities.

#### *9.4.6 The relationship between core and periphery through the property market cycle*

The study has shown that the property market cycle has an influence not only on the level of rents but the differentiation of rents between core and peripheral locations. This was shown in the difference of the level, range and standard deviation of rents across global integration bands. Rents do not just all rise and fall with recession, the fluctuation appears to be much greater in the centre than it is on the edge. One explanation for this finding is that the shifting of prime values within the centre that has taken place because of the spatial reorganisation of Berlin has led to a greater level of fluctuation within the centre.

However, it may also be the case that it is a characteristic of property markets cycles to influence the core more strongly than the periphery. This would be to view market change as a '*ripple out*' process that begins in central locations and is felt less strongly at the periphery. If rent values are logarithmically distributed as a sample, then it would be expected that more variation will occur at the high end of the sample. As the rents are organised spatially, this means more extreme fluctuation in the core. Using independent measures of urban spatial structure to provide more objective measures of what is the core and what is the periphery, it is possible to test this hypothesis on other cities.

## **9.5 Discussion**

### *9.5.1 Why global integration?*

This thesis has demonstrated emergent regularities in the pattern of rents and of commercial land uses that relate to the *independent* spatial structure of the city. The analysis of such regularities has only been possible because an independent measure of spatial structure was applied to the city and it was possible to compare rent and land use patterns against it. It was the absence of such an independent spatial variable that hid some of the main features of rent patterns in previous studies. The use of distance to the CBD in the Alonso model necessarily

assumed a great deal of spatial equilibrium and prevented Alonso from exploring the changing influence of spatial structure on both rent and land use. This study has shown that it is possible to treat morphological structure as independent and research its role in the emergent patterns of rental value and land use that evolve upon it.

However, although this study has revealed regularities in the pattern of rents and their relation to spatial structure, it has not explored the mechanisms at the individual level of firms that give rise to such patterns. Why should rent patterns relate to this particular property of the spatial layout, the global integration pattern? In order to provide an explanation for this finding, a theory is required that can link the physical environment to the social process of rent determination. It must be possible to show how the actions of real individuals can lead to the emergent patterns observed. In other words it is necessary to show how the 'micro-motives' and actions of tenants in individual rented units give rise to the aggregate 'macro-behaviour' of rent prices in the market as a whole (Schelling 1978). However, there is no existing theory for the location variable in terms of the actions of individuals and their repercussions on the emergent market as a whole.

What is required is a *mechanism* to explicitly link individual actors with the spatial pattern of location advantages required for their social interaction and from this the rent patterns that they give rise to when bidding for office space on the market. Although the patterns of rent that emerge from social interaction are unintended and complex, it is ultimately real individuals that are doing the interacting that gives rise to them.

### 9.5.2 *Towards a social theory of rent*

In order to build a proper social theory of rent, a micro-scale study of the activities of individual firms is required as a companion to the macro-scale study presented in this thesis. Such a study would compare the activities of individual firms in more or less integrated locations in order to evaluate which are the salient costs and benefits that lead firms to bid more for more integrated locations.

For the determination of office rents, the costs and benefits to individual companies that are relevant must relate to the potential for *physical co-presence* in some way. This is because the only distinguishing characteristics of spatial locations that remain in the information age are those that relate to actually *being there*. Given the increasing diversity and ease of trans-spatial interaction and information exchange that has come with telecommunications and internet technologies, rents can only reflect something about the potential afforded by face to

face contact, as these are the only remaining aspects that distinguish one *place* from another. All that does not require physical co-presence can be obtained by other means and would therefore not be a characteristic of locations that would command a premium in rent.

The hypothesis is then that rents relate to global integration because this value is a proxy for the co-presence potential that is an emergent property of the spatial organisation of the city. The emergent macro-structure of rents in the market is related to the spatial configuration of the street system through the effect that it has on a myriad of specific location criteria for individual firms. When many individual firms make complex location decisions based on accessibility to specific locations important to their business, the pattern of demand that emerges mirrors the general configurational structure of the street grid. This is because the purely configurational properties of the street grid as a spatial system will tend to influence more specific accessibility decisions: a location that is strategic with respect to the whole city is likely to be more strategic to more specific places important to more individual businesses. What has happened in Berlin is that a huge change in the strategic value of the Eastern centre with respect to the whole city has filtered through to affect the complex decisions of more and more individual firms who are prepared to bid higher rents to be there.

A number of immediately obvious conjectures can be made about the specific mechanism of location advantage that leads firms to bid more for integrated locations. From the perspective of the factors of production, a more globally integrated location offers a larger potential pool of labour, as it will be more strategically located relative to all residences in the city. It also offers access to more suppliers of other factors, enabling better prices to be sought. From the perspective of size of market, a globally integrated location offers easier access to the company for more clients and it might therefore be worth paying a premium for.

What is required in order to select among these conjectures are detailed micro-scale studies of the spatial relationships between office firms and their workers, suppliers, clients and competitors. At present it can only be a possible axiom of the explanatory model of rent determination that co-presence has a value. It is, however, a theorem of the model that spatial structure sets up a potential for co-presence within the city that is differentiated.

### 9.5.3 *The Future of Rent*

In many developed cities of Western Europe and North America, the relationship between street configuration and rent patterns is fairly stable over time- so much so that it can be taken for granted. After all, the pattern must exhibit a high degree of stability for surveyors to be

able to use the comparative method of valuation at all, or for academics to have suggested that distance from the CBD centre is a useful index of rent value. From this viewpoint, the reunification of Berlin appears as a very unusual phenomenon. The scale of spatial restructuring that occurred in Berlin with reunification is very dramatic relative to other cities of the developed world.

However, from the viewpoint of the planet as a whole, the scale of spatial reorganisation in Berlin is not exceptional. Not only is much more of world's population urbanising now but the speed with which cities are growing has been increasing with each wave of urbanisation. This leads to large new areas being added to the spatial structure of the city very rapidly, which changes the emergent pattern of co-presence potential and therefore changes the relative value of locations. Rapid urbanisation poses similar kinds of problems in *revaluing* of location that the reunification of Berlin has done because it also leads to the rapid emergence of a value pattern that is not necessarily as urban planners or anyone else would have expected it to be.

This similarity between the Berlin case and the rapidly changing cities of the developing world points to a wider potential use of measures for urban street configuration in the property market. Change to the configuration of cities take place all the time both in rapidly developing cities and in well established ones. All development projects that affect the infrastructure of a city have an influence on its configuration, whether they are small such as the extension of a residential street or larger such as the building of a bridge or the redevelopment of a train station. Valuers, developers and all others involved in the property market have to make estimates about how important an effect these configurational changes will have on the pattern of location values.

The use of measures such as those presented in this thesis can help this process by providing some independent measure of the potential repercussions of any development on the spatial configuration of the city as a whole. As has been discussed in section 9.3.2, there are limits to the particular methods of analysis used in this thesis. However, the more important point is that the approach of using independent measures of spatial structure to simulate the potential influence of development on the city as a whole is a valuable one. With improvements in the technique, the approach could extend beyond just an evaluation of street configuration and take the whole complex spatial object of the city as a whole, including public transport systems and building interiors.

The relationship between spatial structure and the emergence of location value that has been suggested for Berlin is also one that would apply to any settlement. Wherever humanity chooses to build settlements in the future and with whatever technologies, there will always be an emergent value structure that arises from the co-presence potential created by individuals using the structure in purposive ways. This would be as true for a virtual settlement or an extra-terrestrial settlement as it is for Berlin. Wherever individuals inhabit a spatial system that allows contact with one another, location value is created because the potential for contact is unequal within the system. If a better theoretical understanding of the laws that govern this emergent value can be developed, then measures similar to the one used in this thesis can be used to provide predictive location tools where only intuition and experience currently exist.